23387

IN THE U.S. PATENT AND TRADEMARK OFFICE

Inventor	Hendrik DOHLE et al	
Patent App.	10/553,574	
Filed	29 August 2006	Conf. No. 1571
For	CATHODE FOR A DIRECT METHANOL FUEL CELL AND METHOD FOR ...	
Art Unit	1795	Examiner Suitte, B

Hon. Commissioner of Patents
Box 1450
Alexandria, VA 22313-1450

Appealed 22-Jan-09

APPEAL BRIEF UNDER 37 CFR 41.37

Now come appellants by their duly authorized attorney and submit their brief under the provisions of 37 CFR 41.37.

I. REAL PARTY IN INTEREST

The real party in interest here, as evidenced by the Assignment filed 28 August 2006 at Reel 018298 frame 0402, is Forschungszentrum Juelich GmbH of Germany.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF CLAIMS

The case contains claims 3 through 9, all of which are appealed. Claims 1 and 2 have been canceled. Claims 4 and 8 are independent; claims 3, 5, 6, and 7 depend from claim 4; and claim 9 depends from claim 8. A clean copy of the appealed claims is attached hereto in the Claim Appendix.

IV. STATUS OF AMENDMENTS AFTER FINAL ACTION

An Amendment after Final was filed 06 January 2009 that made no changes to the claims, replaced the drawing on file with a Replacement Drawing that appropriately labeled FIG. 1 as Prior Art, and argued against the final rejection. An Advisory Action of 14 January 2009 stated that the amendment after final would be entered but the arguments therein were not found convincing.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Since the claims have been carefully drafted without legal jargon (e.g. 'said') and to be as succinct as possible, the invention will be described below in the words of the claims and with parenthetical references to the specification as filed 16 July 2008 and FIG. 2 of the drawing as filed 06 January 2009.

(Dependent claim 3 is discussed after claim 4 from which it depends.)

Independent claim 4 describes a method of operating a low-temperature fuel cell with an anode 2a, 2b, 2c (spec. p. 4, l. 24-27), a cathode 3a, 3b, 3c (spec. p. 4, l. 29 - p. 5, l. 3) and an electrolyte membrane 1 (spec. p. 4, l. 23) arranged therebetween, the cathode 3a, 3b, 3c comprising a diffusion layer 3a (spec. p. 4, l. 30) engaging directly against the membrane 1 and a catalyst layer 3b (spec. p. 5, l. 1) on the diffusion layer 3a and bounding a free cathode compartment 3c (spec. p. 5, l. 2), the method comprising the steps of:

causing protons produced at the anode 2a, 2b, 2c to travel (left to right as shown by arrows in FIG. 2) through the electrolyte membrane 1 and then through the diffusion layer 3a of the cathode 3a, 3b, 3c to the catalyst layer 3b, and

supplying oxygen (O_2 from the right in FIG. 2) via the free cathode compartment 3c directly to the catalyst layer 3b.

Dependent claim 3 describes how the diffusion layer 3a of the cathode 3a, 3b, 3c is composed of an ion-conducting material.

Dependent claim 5 recites the use of methanol or a methanol water mixture as a fuel.

Dependent claim 6 describes the oxygen supplied as pure oxygen or as atmospheric oxygen.

Dependent claim 7 further recites the step of:

directly discharging water (H_2O lower right in FIG. 2) produced at the catalyst layer 3b of the cathode 3a, 3b, 3c through the free cathode compartment 3c.

Independent claim 8 describes a low-temperature fuel cell comprising:

an anode 2a, 2b, 2c (spec. p. 4, l. 24-27);

a cathode 3a, 3b, 3c (spec. p. 4, l. 29 - p. 5, l. 3);

an electrolyte membrane 1 (spec. p. 4, l. 23) between the anode 2a, 2b, 2c and the cathode 3a, 3b, 3c;

a diffusion layer 3a (spec. p. 4, l. 30) forming a face of the cathode 3a, 3b, 3c and engaging directly against the electrolyte membrane 1; and

a catalyst layer 3b (spec. p. 5, l. 1) forming an opposite face of the cathode 3a, 3b, 3c, turned away from the anode 2a, 2b, 2c, and bounding a free cathode compartment 3c.

Dependent claim 9 says the diffusion layer 3a is composed of a proton-conducting material.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Rejection A:

Claims 3, 4, 8, and 9 are rejected under §102 on WO 2003/081707 of Kosako. It is noted that US 2004/0209155, which has since been abandoned, is a continuation of PCT/JP03/03479 from which WO '707 evolved, and FIGS. 1-13 of US '155 are identical to FIGS. 1-13 of WO '707.

Rejection B:

Claims 5-7 are rejected under §103 on the combination of Kosako in view of US 2002/0009627 of Smotkin.

VII. ARGUMENTS

Rejection A (Claims 3, 4, 8, & 9 under §102 on Kosako):

As seen by a comparison of FIG. 1 of the instant application and FIG. 12A of Kosako the system of Kosako and the admitted prior art are absolutely identical. More particularly:

APA (FIG. 1)	Structure	Kosako (FIG. 12A)
3a	Cath. Diff. Layer	95
3b	Cath. Catalyst layer	96
1	Membrane	91
2b	Anode Catalyst layer	94
2a	Anode diff. layer	93

Thus in the APA and in Kosako the membrane is sandwiched directly between two catalyst layers. This three layer structure is in turn sandwiched between two diffusion layers.

The rejection refers to FIG. 12B of Kosako that shows bumps 99 on the anode and cathode diffusion layers 93 and 95 said to constitute a structure that anticipates the instant invention. As recited in US '155 at ¶13, which is the only reference to the bumps 99, these bumps 99 are not the intended structure, but instead are defects that, in effect, short out the cathode and anode, to wit:

> [0013] Since the gas diffusion layer is made of fibrous carbon, it is difficult to make the surface thereof completely flat and smooth, and the surface usually has a large number of small projections. This may lead to the following phenomenon: in thermo-compression bonding by a hot press or hot rollers or in fabrication of a unit cell, projections 99 on the gas diffusion layers 93 and 95 compress and penetrate the catalyst layers 94 and 96 and the polymer electrolyte membrane 91 so that the anode and the cathode come in contact with each other, as illustrated in FIG. 12B. It is extremely important to solve this problem in order to provide a polymer electrolyte fuel cell that is free from an internal short circuit.

Thus the structure that is being cited as anticipatory is not only part of the Background, but it is a structure that is recognized as nonfunctional and to be avoided. It is not a teaching of how to make a fuel cell, but instead is a teaching of now NOT to make a fuel cell. It is therefore not anticipatory of the instant invention but is a teaching away. It could hardly be

said that the Kosako teaching of how to make a shorted-out nonfunctional fuel cell is relevant to the instant invention that is aimed at making an operational unit.

Instead FIG. 12A, which corresponds exactly to the APA, is the structure that Kosako intends to construct. That is the teaching of Kosako. This reference is showing in FIG. 12B how a fuel cell can be manufactured so as to be defective, and how it should be in FIG. 12A, which is the known system. The examiner is misinterpreting the teachings of Kosako.

Claim 4 recites a method of operating a fuel cell where the cathode has a diffusion layer 3a "engaging directly against the membrane" 1, whereas Kosako has a cathode diffusion layer 95 separated by a catalyst layer 96 from the membrane 91, except when the fuel cell is defective and bumps 99 on the diffusion layer 95 engage through the membrane 91 and short out the unit. Method claim 4 recites the step of "causing protons produced at the anode to travel through the electrolyte membrane and then through the diffusion layer of the cathode to the (cathode) catalyst layer." If the system were shorted out by the bumps 99 this would not happen and the protons would go only through at the bumps 99 - the path of least resistance - and the fuel cell would not work.

Thus claim 4 recites a structure and method that is completely different from the operational fuel cell shown in Kosako in FIG. 12A. There is some resemblance to the defective, short-

circuited fuel cell of FIG. 12B, but that would operate differently and it cannot conceivably be pretended that it would be obvious to make a fuel cell where the anode and cathode directly contact each other through the membrane.

The teaching of FIG. 12B is therefore not relevant to this invention; the teaching of 12A is what is relevant in Kosako. Since the structure of this invention and how it operates is radically different from that of FIG. 12A, the §102 rejection on Kosako of claim 4 must fall.

Claim 8 recites the same structure as claim 4, with

"a diffusion layer (3a) forming a face of the cathode (3) and engaging directly against the electrolyte membrane (1); and

a catalyst layer (3b) forming an opposite face of the cathode (3), turned away from the anode (2), and bounding a free cathode compartment."

Thus claim 8 distinguishes over Kosako by describing a clear-cut structural difference. Admittedly the shorted-out nonfunctional system of FIG. 12B shows some features resembling what is defined in claim 8, but this is not relevant because Kosako clearly states that this structure is to be avoided and in fact it is the goal of the Kosako invention to avoid making a fuel cell this way, since it is shorted out and does not work.

Interestingly, the novelty of the instant invention was originally recognized by the examiner with the statement in the Office Action of 17 June 2008 that "the prior art does not disclose or suggest the catalyst layer of the cathode is bound directly on the free cathode compartment." For some reason this reasoning was never returned to or acknowledged.

Rejection B Claims 5-7 under §103 on Kosako and Smotkin

The dependent claims stand or fall with the claims from which they depend.

CONCLUSION

The rejection is based on a showing in FIG. 12B of Kosako of a structure that is admittedly defective and nonfunctional. Such a teaching cannot form the basis of a relevant rejection since it is nothing more than a teaching of now not to do something. Thus Kosako in fact teaches that the structure of FIG. 12B does not work and cannot be used, but that structure of FIG. 12A is good and should be used, so that a rejection based on FIG. 12B, especially

one that uses only some elements and ignores others, is clearly incorrect and must be withdrawn.

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VIII. CLAIM APPENDIX

3. The low-temperature fuel cell according to claim 8 in which the diffusion layer of the cathode is composed of an ion-conducting material.

4. A method of operating a low-temperature fuel cell with an anode, a cathode and an electrolyte membrane arranged therebetween, the cathode comprising a diffusion layer engaging directly against the membrane and a catalyst layer on the diffusion layer and bounding a free cathode compartment, the method comprising the steps of:

causing protons produced at the anode to travel through the electrolyte membrane and then through the diffusion layer of the cathode to the catalyst layer, and

supplying oxygen via the free cathode compartment directly to the catalyst layer.

5. The method according to claim 4 in which methanol or a methanol water mixture is supplied as a fuel.

6. The method according to claim 4 in which the oxygen is supplied as pure oxygen or as atmospheric oxygen.

7. The method according to claim 4, further comprising the step of:

directly discharging water produced at the catalyst layer of the cathode through the free cathode compartment.

8. A low-temperature fuel cell comprising:

an anode;

a cathode;

an electrolyte membrane between the anode and the cathode;

a diffusion layer forming a face of the cathode and engaging directly against the electrolyte membrane; and

a catalyst layer forming an opposite face of the cathode, turned away from the anode, and bounding a free cathode compartment.

9. The low-temperature fuel cell defined in claim 8 wherein the diffusion layer is composed of a proton-conducting material.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.